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Then widow's share of first $\frac{1}{2}a$ would be $\frac{1}{3}$ of $\frac{1}{2}a=\frac{1}{6}a$, and the son's share would be $\frac{2}{3}$ of $\frac{1}{2}a=2a/6$ or $\frac{1}{3}a$.

Widow's share of second $\frac{1}{2}a$ would be $\frac{1}{2}$ of $\frac{1}{2}a=\frac{1}{4}a$, and the daughter's share would be $\frac{1}{2}$ of $\frac{1}{2}a=\frac{1}{4}a$.

$\therefore$ Widow should receive $\frac{1}{6}a+\frac{1}{4}a=5a/12$. Son should receive $4a/12$. Daughter should receive $3a/12$.

[See Vol. I., page 127, for solution of a similar problem. Also see Cajori's *History of Mathematics*, page 79. ED. F.]

109. Proposed by B. F. FINKEL, A. M., M. S., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Why do fences and telegraph poles appear to move rapidly in an opposite direction to one traveling in a railway car? [From Moore's *Grammar School Arithmetic*, page 150.]

I. Answer by the PROPOSER.

When we are at rest and observing a moving object, a line from our eye to the object projects the object in different points on the landscape, or, if the object is in the sky, as, for example, a cloud, the line from our eye to the cloud projects the cloud in different points of the sky. By noticing the different projected positions of the object, we become conscious of its motion. Now if we are moving and are looking at some stationary object, the line from our eye to the object again projects the object in different points of the landscape, the appearance being the same as in the case where the object moved and we were stationary. But in this case the apparent motion of the object is opposite to our real motion.

When we are unconscious of our own motion, as, for example, when riding in a car over a smooth road, we attribute the appearance of an object projected in different positions on the landscape to the motion of the object, and since our motion is direct, the apparent motion of the object is retrograde. This motion is more striking as the object upon which our attention is fixed is the nearer, for the reason that the angle of parallax is greater.

II. Answer by G. B. M. ZERR, A. M., Ph. D., Professor of Science and Mathematics, Chester High School, Chester, Pa.

When we are standing on the street watching a moving object, the line from the eye to the object is constantly changing its direction causing us to turn our head in order to follow the object with our eye. When we are sitting in a railway train, the train is moving with us in it and seems to us as if it were still and the objects passing the same as when we were standing on the street. In either case we must turn the head, hence we seem to see the objects passing us instead of our passing the objects.

III. Answer by ALOIS F. KOVARIK, Instructor in Mathematics and Physics, Decorah Institute, Decorah, Iowa.

On the train we are stationary with respect to the cars, but in motion with respect to the earth. Noticing the things next to us not to be in motion, while the posts, etc., outside the car seem passing by on account that we judge mostly by what is near our eyes. It is this that being stationary with respect to the earth, the ancients imagined the sun and stars to move around the earth instead of the opposite.

GEOMETRY.

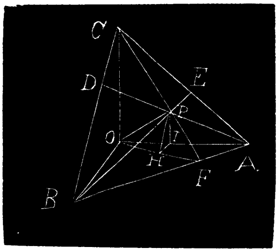
110. Proposed by **P. S. BERG, A. M.**, Principal of Schools, Larimore, N. D.

If the three face angles of the vertical triedral angle of a tetraedron are right angles, and the lengths of the lateral edges are represented by a, b, and c, and of the altitude by p, then $1/p^2=1/a^2+1/b^2+1/c^2$. [Chauvenet's *Geometry*.]

I. Solution by **GEORGE R. DEAN**, Professor of Mathematics, School of Mines and Metallurgy, University of Missouri, Rolla, Mo.; **P. H. PHILBRICK**, C. E., Lake Charles, La.; and **CHAS. C. CROSS**, Libertytown, Md.

Let OC, OB, OA be the edges mutually at right angles; OP the perpendicular. Join AP and produce to meet CB at D; join BP and produce to meet AC at E; join CP and produce to meet AB at F.

$$\text{Then } \frac{\triangle APC}{\triangle ABC}+\frac{\triangle BPC}{\triangle ABC}+\frac{\triangle APB}{\triangle ABC}=1.$$



$$\text{But } \frac{\triangle PAC}{\triangle ABC}=\frac{PE}{BE},\quad \frac{\triangle BPC}{\triangle ABC}=\frac{DP}{AD},$$

$$\frac{\triangle BPA}{\triangle ABC}=\frac{PF}{CF}.$$

$$\text{Therefore } \frac{PE}{BE}+\frac{DP}{AD}+\frac{PF}{CF}=1.$$

$$BE\times BP=OB^2=b^2\;;\quad BE=\frac{b^2}{BP}\;;\quad \frac{PE}{BE}=\frac{PE\times BP}{b^2}=\frac{OP^2}{b^2}.$$

$$AD\times AP=OA^2=a^2\;;\; AD=\frac{a^2}{AP}\;;\quad \frac{DB}{AD}=\frac{AP\times DP}{a^2}=\frac{OP^2}{a^2}.$$

$$CF\times CP=OC^2=c^2\;;\quad CF=\frac{c^2}{CP}\;;\quad \frac{PF}{CF}=\frac{PF\times PC}{c^2}=\frac{OP^2}{c^2}.$$

$$\text{Hence } \frac{OP^2}{a^2}+\frac{OP^2}{b^2}+\frac{OP^2}{c^2}=1,\text{ or } \frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}.\qquad \text{Q. E. D.}$$